

Analysis of Prosthesis Fitting and Rehabilitation Training for Patients with Bilateral Above-Knee Amputation

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Abstract: Objective: To observe the efficacy of prosthesis fitting combined with rehabilitation training in patients with bilateral above-knee amputation.

Methods: A retrospective analysis was conducted on 16 patients with bilateral above-knee amputation admitted to our hospital from January 2024 to September 2025. All patients received postoperative prosthesis fitting and rehabilitation training. The patients' mobility and quality of life during rehabilitation were observed and recorded.

Results: The mobility of all patients improved gradually during rehabilitation. The scores after rehabilitation training were significantly higher than those before training ($P<0.05$). The quality of life scores of patients also increased continuously throughout rehabilitation, with post-training scores notably superior to pre-training scores ($P<0.05$).

Conclusion: Prosthesis fitting paired with systematic rehabilitation training for patients with bilateral above-knee amputation can effectively enhance patients' daily mobility and improve their quality of life during recovery.

Keywords: Bilateral; Above-Knee; Amputation; Prosthesis Fitting; Rehabilitation Training

1. Introduction

Amputation surgery is highly traumatic. Resection of limbs with irreversible loss of physiological function and survival capacity can effectively save patients' lives^[1-2]. Patients with bilateral above-knee amputation lose the ability to walk independently. Prosthesis fitting can assist such patients in regaining locomotion. To help these patients rapidly return to normal daily life, targeted rehabilitation training must be delivered during prosthesis fitting to restore impaired motor function^[3]. This study analyzes the application of prosthesis fitting and

rehabilitation training among patients with bilateral above-knee amputation.

2. Materials and Methods

2.1 General Data

A retrospective analysis was performed on 16 patients diagnosed with bilateral above-knee amputation who received postoperative prosthesis fitting and rehabilitation training in our hospital between January 2024 and September 2025. The cohort included 10 males and 6 females, aged 33 to 54 years, with a mean age of (45.56 ± 1.34) years.

2.2 Interventions

The patient underwent prosthetic assembly and rehabilitation training after surgery, and the prosthetic specifications were designed and selected according to the specific conditions of the patient.

(1) Early postoperative training. In the early stage after surgery, it is necessary to observe the recovery of the patient's stump. Without affecting the recovery of the stump wound, assist the patient to carry out passive activities, a single 10 ~ 15 min, 3 ~ 5 times a day. In the process of passive activity, attention should be paid to the reasonable control of the activity intensity, so as to avoid the discomfort of patients caused by excessive force. Do a good job in early postural management to avoid oppression of residual limbs. The patient's residual limbs were massaged by the nursing staff, according to the way from the proximal to the distal, a single 20 min, 3 times a day.

(2) Mid-rehabilitation (3-8 weeks after surgery). Mainly for patients with prosthetic adaptation training, and began to guide patients to stand, balance and other training. First of all, standing training should be carried out with the assistance of nursing staff, so that patients can stand smoothly with prostheses. After the patient can stand independently, he began to guide the patient to carry out balance training, standing on

one foot, keeping about 15 s each time, 5 ~ 10 times a day. Encourage patients to increase their activity appropriately in combination with their own tolerance. At the same time, balance plate training is needed to guide the patient to stand on the balance plate with both feet, and the posture is adjusted independently by the patient to maintain balance. And gradually in the process of standing training in patients, began to guide patients to shift the center of gravity training, through the center of gravity transfer, reasonable adjustment of posture, to enhance the balance control ability. A single 10 min. The daily joint activities were carried out to bend and extend the position, 10 minutes each time, 5 times a day. In the process of rehabilitation training, the amount of training can be reasonably increased in combination with the patient's own tolerance.

(3) Late stage of rehabilitation (after 9 weeks). After fully adapting to the prosthesis, the patient was instructed to start daily living ability exercises, including sitting down, lifting, turning and walking, and fast walking, so as to quickly return to normal life. At the same time, it is necessary to carry out prosthetic gait training. First, slow walking training should be carried out. It is necessary to pay attention to the reasonable control of step speed and stride length, and maintain balance during the training process. Can gradually increase the walking distance and speed. And try to train up and down the stairs. First lift the left foot, then lift the right foot, assist in adapting to the armrest and other safety protection during training, a single 15 ~ 20 min, 3 times a day.

(4) Other precautions. In the process of rehabilitation training, it is necessary to guide

patients to clarify all aspects of the problems that need to be paid attention to in the recovery stage. Master the daily maintenance skills of the prosthesis, and do their own weight management, to avoid patients in the recovery phase due to weight changes affect the prosthesis weight, etc.

2.3 Observation Indicators

(1) Assessment of Activities of Daily Living

The Activities of Daily Living (ADL) Scale was adopted to evaluate patients' daily mobility during rehabilitation. The scale ranges from 0 to 100 points, with higher scores indicating better independent living ability.

(2) Assessment of Quality of Life

The World Health Organization Quality of Life-Brief Version (WHOQOL-BREF) was used to measure patients' quality of life via self-rated scoring across all dimensions; higher scores represent superior quality of life.

2.4 Statistical Methods

Statistical analyses were conducted using SPSS 26.0 software. Measurement data (ADL scores, WHOQOL-BREF scores, etc.) were expressed as Mean \pm Standard Deviation and compared via t-tests. Count data expressed as percentages were analyzed using Chi-square tests. A P value <0.05 was defined as statistically significant.

3. Results

3.1 Comparison of Activities of Daily Living

Patients' daily mobility improved progressively throughout rehabilitation. ADL scores after training were significantly higher than baseline scores ($P<0.05$), as shown in Table 1.

Table 1. Comparison of ADL Scores ($\bar{x}\pm s$)

Group	Number of Cases	ADL Score
Pre-Training	16	52.45 \pm 3.25
4 Weeks Post-Training	16	63.68 \pm 2.18
8 Weeks Post-Training	16	81.26 \pm 3.05
t/P (Pre-Training vs. 4 Weeks Post-Training)	-	11.478 / <0.001
t/P (4 Weeks vs. 8 Weeks Post-Training)	-	18.757 / <0.001

3.2 Comparison of Quality of Life Scores

Patients' WHOQOL-BREF scores increased

Table 2. Comparison of WHOQOL-BREF Scores ($\bar{x}\pm s$)

Group	Number of Cases	WHOQOL-BREF
Pre-Training	16	63.45 \pm 2.55
4 Weeks Post-Training	16	76.69 \pm 3.06
8 Weeks Post-Training	16	82.45 \pm 3.23
t/P (Pre-Training vs. 4 Weeks Post-Training)	-	13.296 / <0.001
t/P (4 Weeks vs. 8 Weeks Post-Training)	-	5.178 / <0.001

continuously during rehabilitation, with post-training scores significantly higher than pre-training scores ($P<0.05$), as shown in Table 2.

4. Discussion

Patients with bilateral thigh amputation can help patients stand and walk again by assembling prostheses. However, bilateral thigh amputation is a more serious type of surgery. The operation is traumatic and the patient's postoperative recovery period is longer^[4-5]. It is difficult for patients to adapt to the use of prostheses in a short time after prosthetic assembly. In the process of rehabilitation of patients, it is necessary to guide patients to carry out rehabilitation training in time on the basis of reasonable selection of prosthetic limb types in combination with the recovery of patients, so as to help patients recover their damaged functions^[6-7].

In this study, 16 patients with bilateral thigh amputation were in the postoperative recovery stage, and the stage rehabilitation training program was formulated by the later personnel in combination with the rehabilitation of the patients. Through early rehabilitation training, passive activities, massage, etc., it is helpful to relieve the discomfort of the patient's residual limbs and help the patient quickly adapt to the wearing of prostheses. In the middle stage of rehabilitation, it helps patients to accurately carry out rehabilitation training in all aspects after assembling prostheses, helps patients to master the way of using prostheses to carry out activities, and enables patients to complete routine movements such as auxiliary standing and balanced walking. In the later stage of rehabilitation, the amount of activity is gradually increased in combination with the recovery of the patients, which can help the patients to improve their independent activity ability and promote the patients to return to normal life as soon as possible. Through observation, the daily activity ability and quality of life of the patients in this group were improved after rehabilitation training, indicating that the rehabilitation training measures were beneficial to the recovery of the patients.

Comprehensive research, prosthetic assembly and rehabilitation training for patients with bilateral thigh amputation can increase the daily activity ability of patients and improve the quality of life of patients in the recovery stage.

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